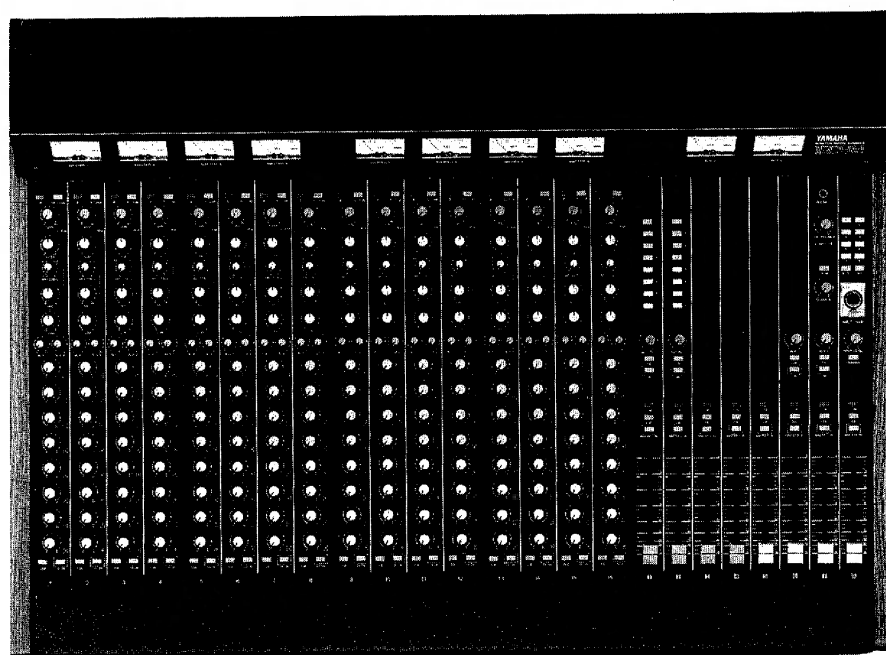


YAMAHA

**MC series
Monitor Mixing Consoles**

OPERATING MANUAL

**MC1608M
MC2408M**



MC1608M

HOW TO USE THIS MANUAL

Thank you for purchasing a Yamaha MC1608M / MC2408M monitor mixing console.

To take full advantage of your mixing console, we recommend that you read this manual carefully.

After reading the INTRODUCTION, INSTALLATION and OPERATING TIPS sections, examine the FRONT PANEL OPERATION and REAR PANEL CONNECTIONS sections, so that you can thoroughly familiarize yourself with this versatile unit.

The SYSTEMS EXAMPLES section suggests some applications for this mixing console. It is impossible to illustrate the unlimited number of setups available to you, but this section gives you an idea of the flexibility of the MC monitor mixing console.

Finally, the last four sections of the manual supply you with full specifications, block diagram and level diagram. Serious study of these sections will answer many of your signal routing questions and enable you to use this unit to its full capabilities.

Your Yamaha MC monitor mixing console should provide you with years of trouble-free service, and satisfy your requirements in the widest possible variety of applications, and is designed to be fully compatible with all professional equipment.

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INTRODUCTION

The Yamaha MC1608M/2408M Monitor Mixing Consoles are versatile, portable, and reliable. They are designed to provide flexible, efficient stage monitoring for performing musicians. The ability to be able to hear his own performance blended with an individually balanced mix of his fellow musicians gives a performer the opportunity to concentrate on his art totally, and these units are created to give exactly this engineer, with their fully professional compatibility, uncompromising electronic performance, and highly versatile control capabilities.

The mixing console you now own offers eight different monitor mixes, via eight busses controlled by compact rotary controls. Two auxiliary channels may be used for a variety of purposes — patching in echo or signal processing units, feeding a tape deck in order to record a show, two additional outputs, or providing monitor mixes for the operator, stage manager, etc.

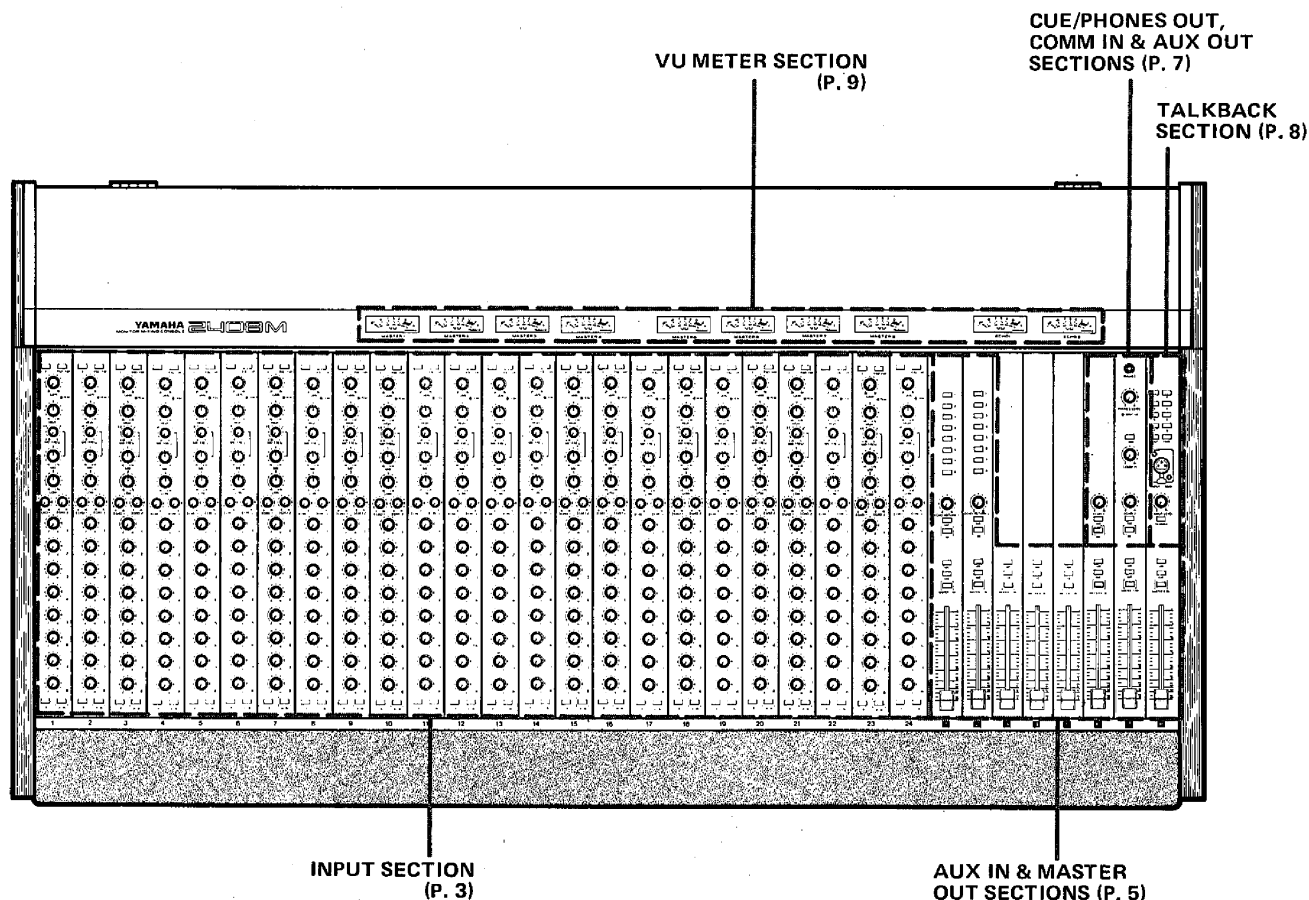
Insert patch points on all input channels and out busses means that you can, for example, compress an individual vocalist, or use a graphic EQ on each mix, to get maximum levels without feedback. Judicious equalizing with the three band EQ and high-pass filter will also greatly assist in eliminating unwanted noise, harmonics, wind noise, or microphone popping.

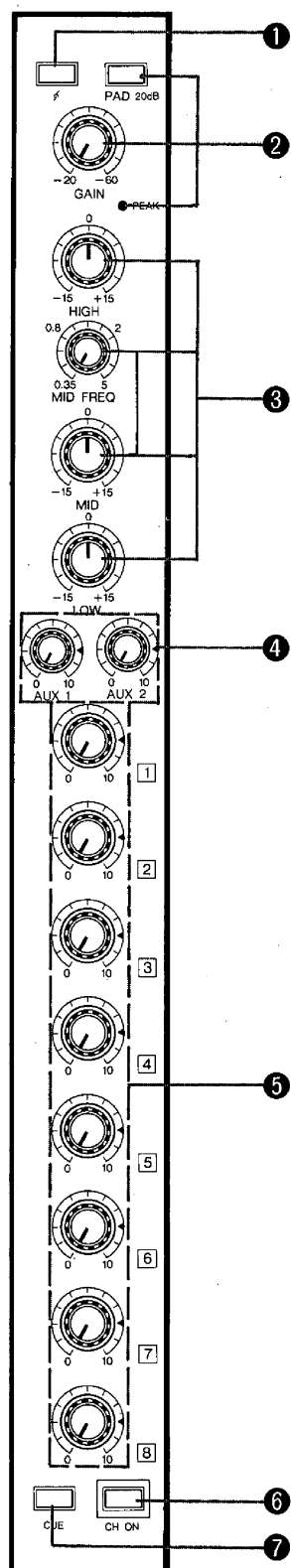
***FOR QUICK REFERENCE, THE FRONT PANEL OPERATION SECTIONS ARE ORGANIZED ACCORDING TO THE FOLLOWING DIAGRAM**

*** The explanations in this manual are organized into sections corresponding to the diagram below.**

The following text contains many similar comments in reference to each feature, but we encourage you to use your own creativity to it's fullest, in discovering new ways of using your console. Most of the features on Yamaha MC mixing consoles are designed to be multi-purpose, and this console can function as the center of an almost unlimited number of system configurations, to fulfill your specific needs. You may well find, after using your MC monitor mixing console for a while, that there is a simpler, more economical way of connecting the unit into your system. This would certainly time, for example, if you are on a hectic touring sche-

And, if needed, your MC1608M/2408M can be more than just a monitor mixing console. This unit can function efficiently in many different mixing situations. No matter how experienced you are, your new MC monitor mixing console gives you the opportunity to take mixing techniques a significant step further — to where mixing is transformed from a skilled craft — to a creative art.





1 Phase Reverse switch

This switch reverses the phase of the XLR connectors. In the normal position (switch up), pin 2 is positive (hot), and pin 3 is negative (cold), and input and output signals are the same. Reverse phase by depressing this button, making pin 2 negative (cold) and pin 3 positive (hot). Out-of-phase signals are often caused by differing wiring configurations in microphone or mixing console cables, especially due to differing national standards.

2 PAD switch, GAIN control and PEAK LED

These offer complete control over the input sensitivity. The gain control continuously adjusts the sensitivity of the transformerless head amplifier between -20 & -60 dB. If this is insufficient, in the case of particularly high signal levels, depressing the pad switch will insert a 20dB attenuator before the head amplifier.

The red LED peak indicator lights whenever the post-EQ, pre-fader signal comes within 3dB of clipping, warning the operator of impending channel overload. As a protective measure it is advisable, when inserting a signal into a channel, to set the gain control to minimum, and gradually raise the setting to the required level.

3 HIGH, MID FREQ/MID and LOW CONTROLS

These low-noise, low-distortion equalizers offer three bands of EQ, with ± 15 dB of gain, in the following ranges:

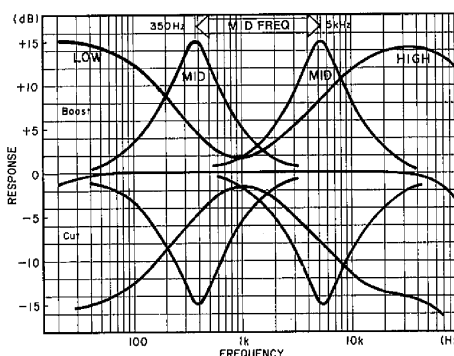
HIGH: 10 kHz shelving type.

MID: 350 Hz — 5 kHz peaking type.

LOW: 100 Hz shelving type.

Response is flat in the center "0" position.

The variable frequency mid-range control is versatile enough to be used for feedback control.



4 AUX 1 & 2 controls

These controls feed a post-EQ signal to the AUX 1 & 2 output busses. They may be used as "send" controls, to an effects unit or compressor; as outputs to a tape deck; or as extra monitor outputs for the engineer, stage manager, etc.

NOTE: The AUX signal can be changed from pre-channel volume to post-channel volume by changing an internal jumper. (See the diagram on the right page.) This modification can be made at any service center (see SERVICING section).

5 Input Mix Level controls

On each channel, eight smooth-operating rotary controls adjust the level of the signal sent to the master outputs, giving eight independent monitor mixes. Conventionally, the method would be to "assign" each of the level controls to each of up to eight performers, so that when a musician asks for a change in his monitors, you know exactly which control to go for. Nominal output level is obtained with the control at position 8 on the scale.

6 CH ON switch

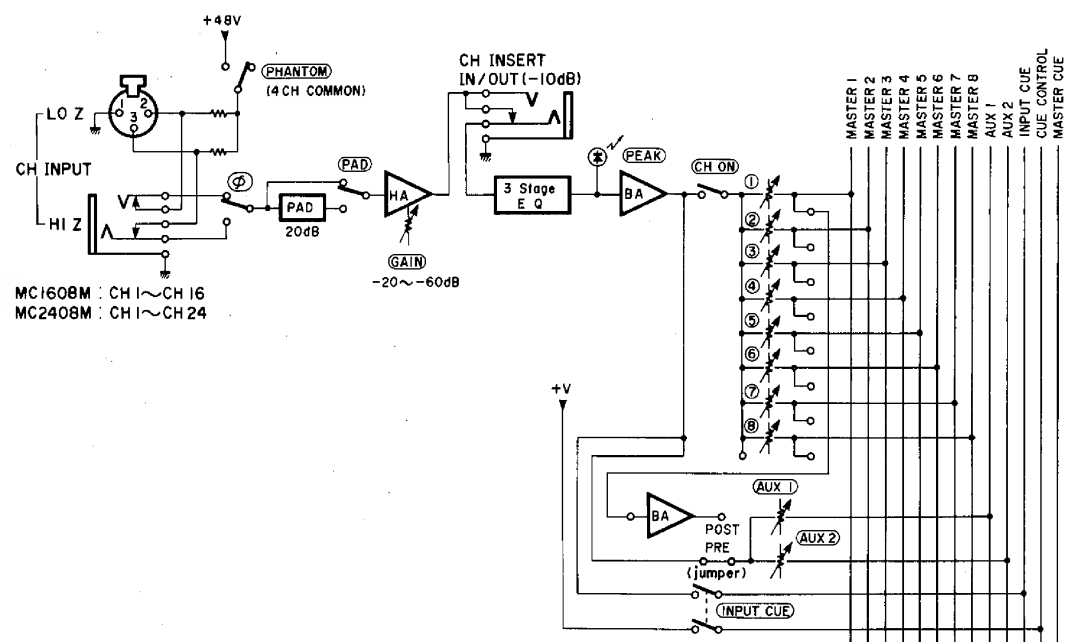
The CH ON switch turns the channel on (switch DOWN) or off (switch UP) without disturbing previously set levels, as it intercepts the signal before the mix level controls (after Insert in/out). This can be helpful in minimising channel noise during quiet musical passages or when all channels are not being used.

7 CUE Switch

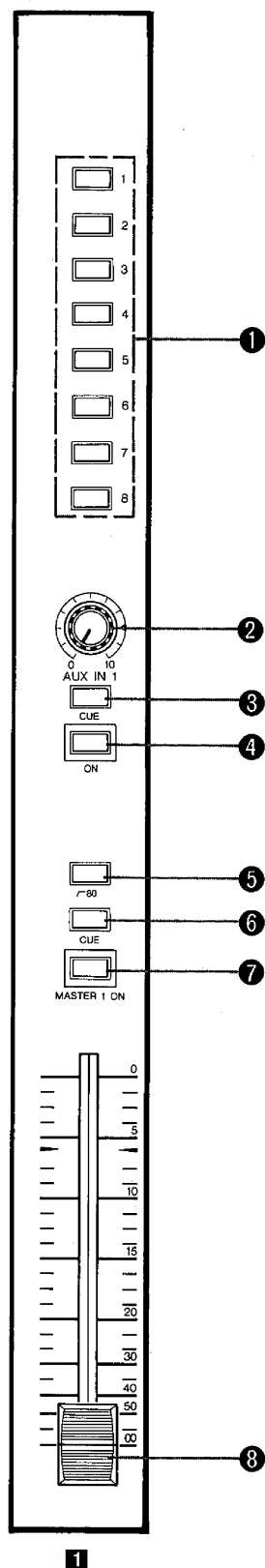
The switch allows a single selected input channel or a group of input channels to be monitored through the operator's headphones or monitor speaker, regardless of whether a master CUE button is on or off. If more than one CUE switch is pressed, the signals from the corresponding channels are summed and fed to the headphone output. This makes it easy to set EQ or effects on a channel while other channels are "live", and to locate unwanted noise or hum from instruments.

Please note that the input CUE LED indicator will light when any input CUE switch is on, as it has priority over the master CUE switch.

This switch functions whether the CH on switch is on or off.



AUX IN & MASTER OUT SECTIONS



1 AUX IN Assign switches

Pressing an AUX IN assign switch will send the auxiliary input signal to the correspondingly numbered output buss.

In the case of an echo unit connected to the auxiliary input, this would allow any or all of the players to have echo in their monitor mix.

2 AUX IN level control

This control is used to set the level of the signals received at the auxiliary inputs. Nominal level is obtained with the control set at 8.

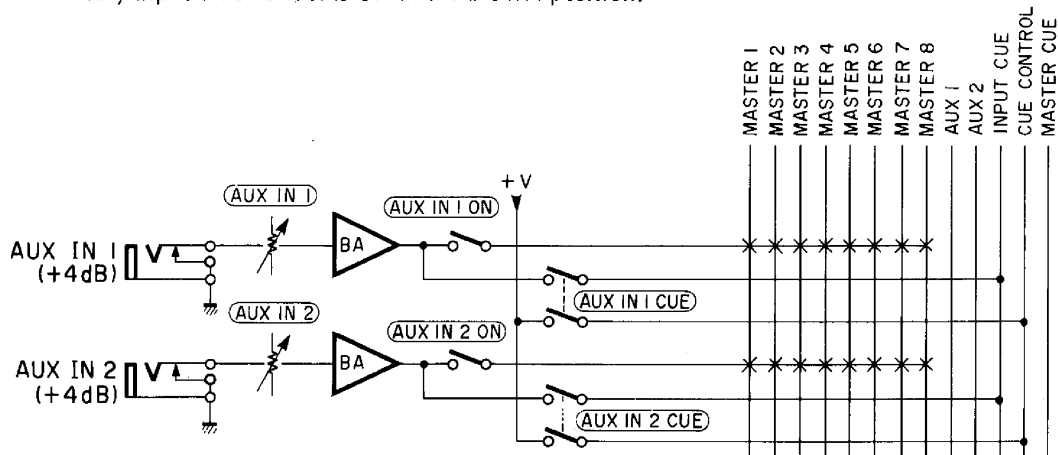
Again, this is useful if the auxiliary inputs are used for echo or signal processing, when it will function as a "return" and provide exact matching with of output level the effects unit you are using.

3 AUX CUE switch

Depressing the auxiliary CUE button mutes all master CUE signals in the headphones, permitting the engineer's checking of only the selected auxiliary signal, regardless of whether a master CUE switch is on or off. Please note that as with the input channel cue switches, engaging an AUX in cue switch will cause the input CUE indicator to light. This switch can be used whether the AUX in switch is on or off.

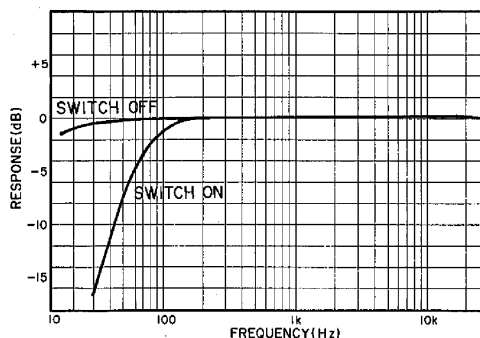
4 AUX In ON switch

This switch, like the input channel ON switch, provides an instant means for turning the auxiliary input on or off. It is ON in the DOWN position.



5 80 (high pass filter) switch

Depressing this switch inserts a filter on the master output below 80Hz, with a roll-off of 18 dB/octave. Monitor speakers are often compact and unable to handle low frequencies at high levels. This filter will enable you to roll-off the low end and raise the overall monitor level, as well as reducing wind noise, microphone "popping", and AC mains hum.



6 Master CUE switch

Pressing the master CUE switch permits headphone monitoring of a single master output (including any signal received at a master insert). If more than one master CUE switch at a time is pressed, all the corresponding signals may be monitored. This switch will operate whether the master ON switch is on or off.

An indispensable feature which allows the engineer to hear the same monitor mix as any of the performers, and make necessary adjustments.

NOTE: The master CUE signal will be muted if any input or AUX input CUE switch is depressed.

7 Master ON switch

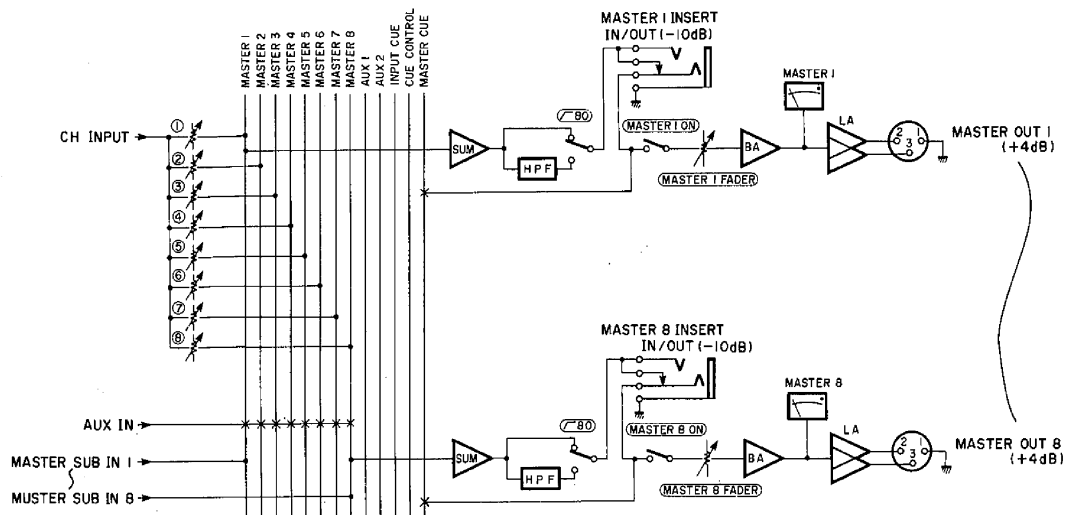
The master ON button allows instant cancelling of the master output, pre-fader, without affecting any settings. It is ON in the DOWN position.

A useful feature for cancelling a performer's mix if he is not required to play in one song, especially if it is a quiet passage where the onstage sound could affect the sound reaching the auditorium.

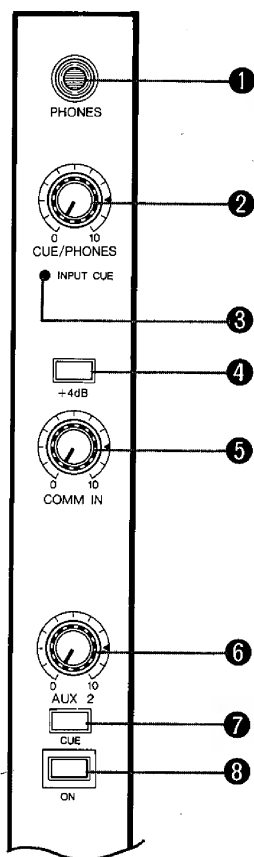
8 Master fader

Signals from the channel inputs, auxiliary inputs, and submaster inputs are routed via the master mix busses to a 100 mm smooth linear master fader. Position "6" on the fader scale (marked with bold arrows) gives nominal output level, which can of course be checked on the VU meters.

The eight faders also provide a good visual indication of the overall mix levels.



CUE/PHONES OUT, COMM IN & AUX SECTIONS



1 PHONES

This is the output for the operator's stereo headphones. Low impedance type stereo headphones should be used. Any CUE'd signal, and any input to the COMM IN jack (normally, the talkback from the house PA console) may be monitored at this output.

2 CUE/PHONES level control

This control is used to control the signal level at the CUE output, and operator's headphone volume. Nominal level is obtained with the control at 8 on the scale.

3 INPUT CUE indicator

This LED indicator will light when any of the channel input CUE switches, or AUX in CUE switches are turned on. Please note that this indicator is unaffected by the master CUE switches; even if the master CUE switches are engaged, this indicator will not light.

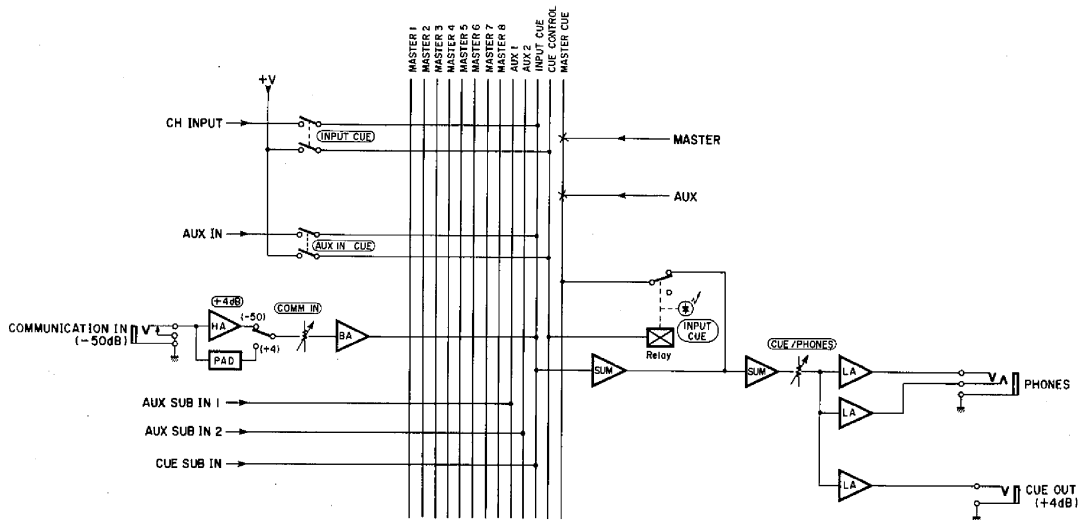
This indicator is a particularly useful visual reminder if the operator has temporarily removed his headphones.

4 COMM IN +4 dB switch

For direct communication with the house PA engineer, the normal procedure is to connect the talkback or foldback output of the house PA console to the COMM IN jack on the rear of the MC monitor mixing console. In this case, the -50 dB pad should be inserted (switch DOWN) to maintain a compatible signal level. If a microphone is connected to the COMM IN jack (for example, for use by a stage manager) the $+4$ dB switch can be turned off (switch UP). When this switch is in the OFF position, nominal input level is -50 dB; when it is ON, nominal input level is $+4$ dB.

5 COMM IN level control

This control is used to set the headphone monitoring level of the communication input (COMM IN). Rated input level is obtained with the control at position 8.



6 AUX OUT level control

This controls the level of the signal from the AUX buss, received from the input channel AUX controls and auxiliary sub inputs. Nominal output level is obtained with the control at position 8. The VU meters allow visual monitoring of the output level.

7 AUX OUT CUE switch

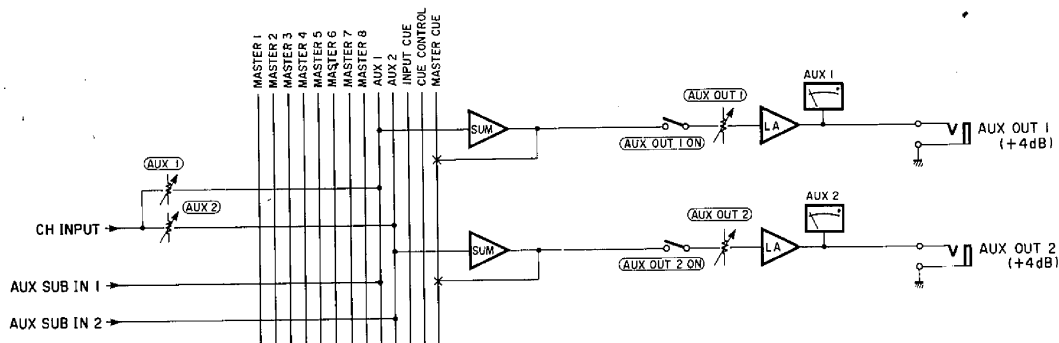
Depressing this switch allows the AUX signal mix to be monitored via headphones or the operator's monitor speaker. Regardless of whether the AUX out on switch is on or off, the two AUX OUT CUE switches may be used singly or together.

This is useful for easy checking of effects levels, or any signals routed to the AUX busses.

CUE/PHONES OUT, COMM IN & AUX SECTIONS

8 AUX OUT ON switch

Putting this switch in the ON position (switch DOWN) turns the auxiliary output channel on. In the OFF position (switch UP) the signal is cut before the AUX out control, allowing the channel to be instantly muted.



TALKBACK SECTION

1 Talkback Assign switches

These switches determine to which buss the talkback signal is routed. Talkback may be sent to any of the eight master outputs, the two auxiliary outputs, and the TB OUT connector.

This provides communication not only with the performers, but also with the house sound engineer (normally via the TB OUT facility), stage staff or even dressing rooms (the AUX outputs are suitable for this purpose).

2 Talkback Input

A low impedance microphone should be connected at this terminal for talkback use. Nominal input level and impedance are $-50\text{ dB}/50\text{--}250\text{ ohms}$.

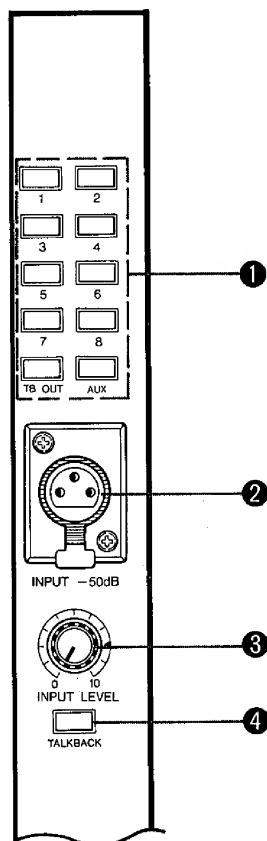
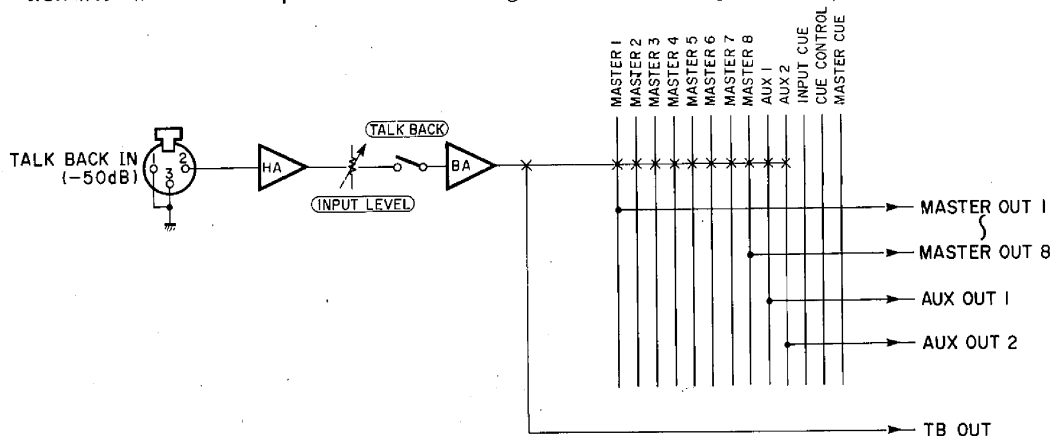
This offers the advantage of being able to use the microphone of your choice, rather than limiting you to a built-in microphone. One possibility would be to use two-way communications headset, which would provide greatly increased mobility.

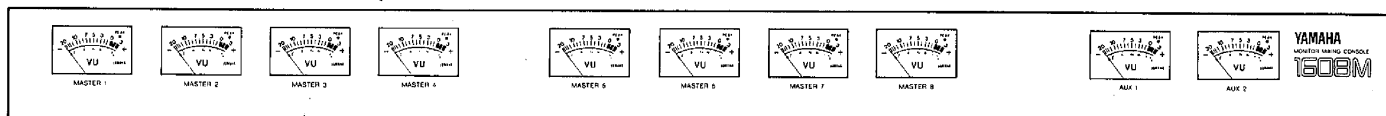
3 Talkback INPUT LEVEL control

This control allows you to adjust the sensitivity of the TB input channel, to match the microphone you are using. Nominal output level is obtained with the control at 8 on the scale.

4 TALKBACK switch

Turning this switch ON (switch DOWN) activates the TB microphone, providing communication with whichever outputs are selected using the Talkback Assign switches.



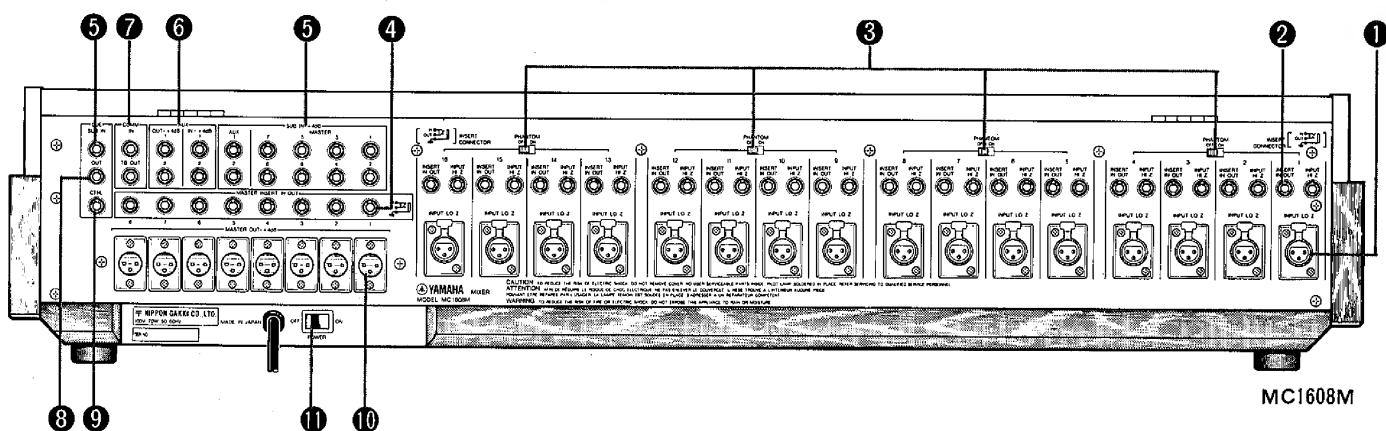


The large, illuminated VU meters are all equipped with built-in peak LED indicators. The meters accurately indicate post-fader output levels of master channels 1-8, and AUX 1 & 2. When the meters read 0 VU, nominal output levels (+4 dB) are obtained. The peak indicators light at 8 dB above 0 VU.

A signal which on the VU meter has an acceptable average level may well have high peaks. The peak indicators will show this instantaneously, allowing the operator to reduce the signal level accordingly, to avoid distortion on transients such as drum sounds or synthesizer attacks.

VU METER Reading	-20VU	-10VU	-5VU	0VU	+3VU
+4dB Output Level	-16dB (123mV)	-6dB (388mV)	-1dB (691mV)	+4dB (1.23V)	+7dB (1.74V)

REAR PANEL CONNECTIONS



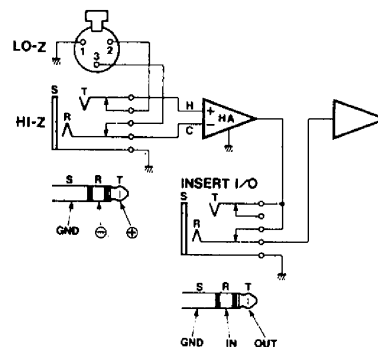
MC1608M

1 CHANNEL INPUT connectors

Each input channel has an electronically balanced low-impedance XLR type input connector, for fully professional microphone compatibility, and a balanced high-impedance tip-ring-sleeve type 1/4" phone jack for line inputs. An internal phantom power supply, switchable in 4-channel groups, is provided to handle condenser microphones. (See paragraph 3 below).

In a normal monitoring situation, the signals from the performers are sent via a splitter system to both the house PA console and to the monitor mixing console at these input connectors. With the gain control and 20 dB pad (see FRONT PANEL section) virtually any source—microphone or line—can be handled with no problem. (See the diagram at the right.)

automatically. A particularly useful feature allowing modifications of single instruments or voices. For example, a noise gate could be used to eliminate monitor hum from an electric guitar, or a compressor/limiter would add more clarity and punch to a lead vocal. (See the diagram below.)



TRS Wiring Block Diagram

2 CHANNEL INSERT IN/OUT connectors

A single tip-ring-sleeve unbalanced jack gives in/out access to the channel input section between the gain control and the equalizer section. If no jack is inserted, the insert circuit avoids the need of a jumper by closing

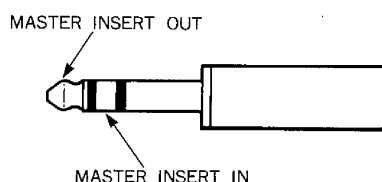
③ PHANTOM power switch

These switches turn the internal phantom power supply on and off in 4 channel groups. Turning the switch on applies 48 V DC across pins 2 & 3 of the XLR-type input channel connectors. Be sure to turn the power supply OFF when it is not in use. Since phantom power is not normally required for high-impedance sources, the phone jacks are not connected to the power supply.

IMPORTANT: The phantom power supply has no effect on balanced dynamic microphones or line sources, even if left on. However, unbalanced sources, or transformers with earthed center taps are liable to hum or even damaged if connected to the phantom power supply when it is on.

④ MASTER INSERT IN/OUT connectors

As with the input channel inserts, a single unbalanced TRS jack permits access to the signal path between the master mix buss and the master fader, with an automatic closing device if this connector is not used. This is ideal for inserting devices such as graphic equalizers (to reduce feedback or "customize" the sound of an individual monitor mix) or a limiter to prevent monitor overload.



⑤ SUB IN (MASTER, AUX, CUE) connectors

These unbalanced input connectors allow a second monitor mixing console to be "cascaded" with the main monitor console in situations where more inputs are needed (for example, a big band, orchestra, or a band using multiple keyboards and complex drum micing). The master sub, auxiliary sub, and Cue Sub Inputs are connected with the corresponding Outputs of the second console, enabling the master controls of the main console to control both units.

If two MC2408M's were used in this way, a total of 48 inputs would be available—sufficient for virtually any conceivable situation.

⑥ AUX IN, AUX OUT connectors

These unbalanced input/output jacks, operating at the professional level of +4 dB, are provided to allow effects devices to be patched in. With an echo unit, for example, they could be considered as echo send/return points, with the levels adjusted by the controls on the front panel.

The AUX OUTs can also be used to supply two additional monitor mixes, as AUX OUT controls are incorporated into each Input Channel. This feature could, for example, feed a stereo tape deck, or provide monitor outputs for an operator's speaker or a dressing room speaker.

⑦ COMM (IN, TB OUT) connectors

The COMM IN jack enables the foldback or talkback output of the house PA console to be connected to the MC monitor mixing console for communication between the two engineers. In this case, the -50 dB switch would need to be used to keep the signals compatible.

This input can also be used as a microphone input, e.g., for communication with a stage manager, lighting director, or conductor. The -50 dB switch is not required for this application. In either case, the communications input would be headphone monitored by the operator, adjusting the level with the COMM IN control on the front panel.

The TB OUT jack enables the monitor operator's talkback signal to be sent to the house PA console or other location, thus completing a 2-way communications setup.

⑧ CUE OUT connector

This unbalanced output terminal supplies the signal for the operator's monitor speaker system. When cascading two monitor mixing consoles, it would be connected to the CUE SUB IN jack of the main console. As it is rated at +4 dB, it can feed another headphone monitoring system for use by an assistant engineer, road manager, or even a video director.

The level at this output is adjusted by the CUE/PHONES level control on the front panel.

⑨ CUE CONTROL connector

When two Yamaha MC monitor mixing consoles are cascaded together, connecting the CUE CONTROL terminals of both consoles, via a standard 1/4" jack cable, allows operation of the INPUT CUE or AUX IN CUE functions from either of the units.

This feature allows headphone monitoring of cue'd signals by both the monitor engineer and an assistant if needed.

⑩ MASTER OUT connectors

Each master buss has an electrically balanced XLR-type output connector, to feed the monitor amplifier systems.

⑪ POWER switch

Turning the switch on supplies power to the unit. The VU meters illuminate to indicate power is on.

IMPORTANT: This switch should be OFF while connecting the console to the mains.

INSTALLATION

IMPORTANT!

- * This unit is designed to operate within $\pm 10\%$ of rated voltage.
- * Ideally, these units should be used in a dust-free environment, with low humidity. Do not install them near heaters, or near equipment that causes noise or hum.
- * After you have finished reading this manual, be sure to store it in a safe place, together with the guarantee certificate.

AC POWER CONNECTION (for models with 3-wire power cable)

Mixing consoles provided with a 3-wire power cable should be AC grounded for safety and optimum shielding against noise. If a 3-wire AC outlet is not available, or there is any chance that the AC outlet is not grounded, a separate ground wire must be connected from the console chassis to an earth ground. Cold water pipes generally provide a good ground, unless they are insulated by PVC plastic, or are fitted with a water meter. Avoid hot water pipes and gas pipes.

When a convenient, confirmed ground is not available, use a length of copper pipe driven into moist, salted earth to a depth of at least 1.5 meters (5 feet). Alternatively, use a chemical type grounding rod.

HOOK-UP CABLES AND HUM AVOIDANCE

The MC monitor mixing console's primary inputs and outputs feature electronically balanced circuits and connectors. When these connectors are used with the appropriate 2-conductor shielded cables (e.g. standard microphone cables) these circuits provide optimum protection against hum and noise pickup. The XLR type connectors are wired with pin 2 as "audio high" and pin 3 as "audio low", on accordance with DIN and JIS standards. In the balanced TRS connectors, the tip is audio high and the ring is audio low. Pin 1 in the XLR connectors, and the sleeve in the TRS connectors are ground.

Some professional audio equipment and microphones are wired with pins 2 and 3 (XLR) reversed. Generally, this will cause no problem other than a polarity reversal. However, if such a piece of equipment uses a balanced-type connector for an unbalanced input, or an adaptor is used to match an unbalanced connector to a balanced input, the high side of the audio circuit could be grounded. In this case, reverse the audio high and audio low wiring at one end of the connecting cable, or use a suitable polarity-reversal adaptor. Regardless of connector polarity, if hum is encountered try cutting the shield connection at one end of the cable.

All unbalanced phone jacks are intended for use with standard tip-sleeve 1/4" phone plugs and single-conductor shielded cable. Do not attempt to reduce hum by cutting the shield connection on these cables. Rather, restrict unbalanced cables to about 3 meters (10 feet), and try to set up the system so that either (a) the equipment involved is all connected to the same AC circuit, or (b) the third-wire AC mains ground is used on only one piece of equipment, typically the mixing console.

IMPORTANT: Breaking the ground path can create a **SHOCK HAZARD**. When routing cables, especially unbalanced cables, avoid strong sources of electro-magnetic interference or radio frequency interference generated by electric motors, fluorescent lights, dimmer panels, etc. To avoid crosstalk-induced feedback, never bundle microphone cables with mixing console output cables: these cables should cross at right angles where practical.

GROUNDING

Careful grounding procedures are essential for proper operation, not only of the monitor mixing console, but of the entire audio system. Many grounding techniques exist, and a number of books have been written on the subject. The following are good sources of information on grounding and related subjects.

THE AUDIO CYCLOPEDIA by Howard M. Tremaine

(Pub. Howard W. Sams)

SOUND SYSTEM ENGINEERING by Don and Carolyn Davis (Pub. Howard W. Sams)

GROUNDING AND SHIELDING IN INSTRUMENTATION by Ralph Morrison (Pub. John Wiley & Sons)

"Ground loops" are often caused by multiple paths from the equipment grounds to the AC mains ground (or earth ground). Ground loops are a major cause of hum and noise in an audio system. In severe cases, ground loops can even cause the equipment involved to break into oscillation. This can cause distortion and even damage to amplifiers and speakers. One way to avoid ground loops is to make sure that there is only one path to the AC ground or the entire audio system. A popular method is to cut the shield ground of balanced cables at the input end of the cable. Another technique is to ground all shields at one piece of equipment, typically the console, and cut the shields at the other ends of the cables. (Note: this is NOT possible with unbalanced cables).

CHECK MAINS VOLTAGES

Connect the mixing console to the AC mains only after confirming that the line voltage and frequency are correct. A simple check with a voltmeter can save your equipment — and the show. It is also a good idea to check for proper polarity at the AC outlet. The power switch on the console should be OFF before connection to the mains. As a further precaution, disconnect the console from the mains while audio cables are being installed.

OPERATING TIPS

MATCHING INPUT CHANNEL SENSITIVITY TO THE SOURCE

The pad switch and gain control on each input channel permit adjustment of the input sensitivity between -60 dB and 0 dB. With the pad out, the gain control has a sensitivity range of -60 dB to -20 dB. With the pad in, this range is -40 dB to 0 dB. This makes it possible to match the input sensitivity to a broad range of input sources.

The following setting will generally apply:

Low output dynamic microphones: -50 dB.

Medium output condenser microphones: -40 dB.

Preamplified electric instruments and low level (creative audio or hi-fi) line sources: -20 dB.

High level (professional) line sources: 0 dB

We suggest the following procedure for setting input levels:

1. Connect all input sources to their respective channels. Monitor the mix on low-impedance type headphones. **DO NOT** connect the console to any power amplifiers yet.
2. Set the CUE/PHONES level control to about "8". You will monitor each input channel by pressing the CUE button on the respective input channel module.
3. Set master fader #1 to about "6"—this is the position that gives rated output level, which can be checked on the corresponding VU meter.
4. Adjust input channel mix level control #1, on the channel that you are setting, to position "8". This will send the input signal to master output #1, at rated output level.
5. Start with the lowest input sensitivity (PAD switch in the DOWN position, GAIN at -20 dB). With the input CUE button on, so that you can monitor the signal on headphones, gradually increase sensitivity using the GAIN control until the signal is clearly audible. If sensitivity is too low even with the GAIN control at maximum, return this control to the -20 dB position, set the PAD switch in the UP position, and slowly bring up the GAIN control again.

At the optimum setting, VU meter #1 should be peaking around 0 VU. If the meter consistently shoots past 0 VU, or if the signal sounds distorted in your headphones, the input sensitivity is too high, and you will need to decrease it until the levels are correct.

As a visual aid, the peak LED on the VU meter should only light on occasional loud peaks. If it is on longer than this, the input sensitivity should be reduced.

6. Repeat this procedure for each input channel, until all channels are set for proper input sensitivity. Turn the mixing console power OFF, and connect your outputs. Turn the power ON again. You are now ready to adjust the remaining mix controls on each channel.

IMPORTANT: The console, and all signal processing devices connected to it, **MUST** be turned on **BEFORE** the power amplifiers are turned on. If this procedure is not followed, the console turn-on transient could easily cause damage to your loudspeakers. This procedure should be reversed when the system is turned off.

USING THE EQ CONTROLS

The HIGH, MID and LOW EQ controls on each input channel have no effect ("flat response") when centered. Turning the controls clockwise boosts the frequency response, while an anti-clockwise rotation from the center position reduces frequency response. A full ± 15 dB of filtering is available in each frequency range. The use of EQ controls on a monitor mixing console is quite different than a auditorium or studio console. Two important factors need to be considered:

1. The particular needs of each performer are of course the concern of the monitor mixing console operator. This unit offers eight independent mixes (ten, if the AUX channels are used for this purpose). A musician may desire his instrument or voice to stand out above the other instruments; he may prefer a homogeneous blend of sounds, with nothing particularly prominent; or in special circumstances may wish to hear only a few selected instruments. In each case, judicious equalizing can help to improve clarity in any balance of sounds.
2. With several monitors on stage, pointing in various directions, feedback is always a concern. The careful use of EQ, particularly the MID section, can help to reduce peaks at the feedback frequency, and enable you to set the overall level higher without risk of feedback. If graphic equalizers are used (see SYSTEMS EXAMPLES) fine feedback control can be carried out on individual monitors.

A few pointers on the individual EQ controls:

HIGH

The HIGH EQ control adjusts frequency response above 10 kHz (Shelving type, ± 15 dB). Boosting this control adds more "edge" or "bite" to string instruments, and more "attack" to percussion sounds. Reducing high EQ can assist in removing unwanted sibilance (lisping) from vocals, and lessen string noise on guitars, breath noise on wind instruments, and general hiss in the system. High EQ cut can make a performer sound further away, particularly if used with reverb, and help his sound to blend in with the accompaniment. It can also greatly reduce high-frequency feedback.

MID

The MID control permits peaking type boost or cut by ± 15 dB at the frequency determined by the setting of the MID FREQ control. The range of this control is 350 Hz – 5 kHz. Boosting mid-range (especially at around 2.5 or 3 kHz) can greatly increase the "presence" of a sound. On vocals, this will make the singer "stand out" from the backing, almost as if they were closer to the listener. This control is ideal for making any single instrument more prominent (a common request from performers who wish to hear themselves in their monitor) without increasing the overall level and risking feedback. Cutting the mid-frequencies has the opposite effect – the sound will seem to recede and become "thinner". This can help to reduce the power of the instrumental backing, should a vocalist desire this.

LOW

Operating below 100 Hz (shelving type ± 15 dB), the LOW control can add more "fullness" to vocals, guitars, and keyboards, and give a more "mellow" quality to horns and woodwinds. Cutting low frequencies can remove boominess, reduce excessive energy from drums, and decrease AC mains hum and stage rumble. When using compact monitor speakers that are unable to handle powerful bass frequencies, reducing the low EQ response on certain instruments can permit high monitoring levels without distortion or system damage.

HIGH PASS FILTERS

The high pass filters incorporated into each master output can also assist greatly in the reduction of bass boominess, and protect your monitor speakers. The use of these filters will give a clearer, brighter tone to the monitor mixes, which is often highly desirable, particularly in large reverberant halls or outdoor concerts where extraneous noise and wind can make monitoring difficult.

SYSTEM EXAMPLES

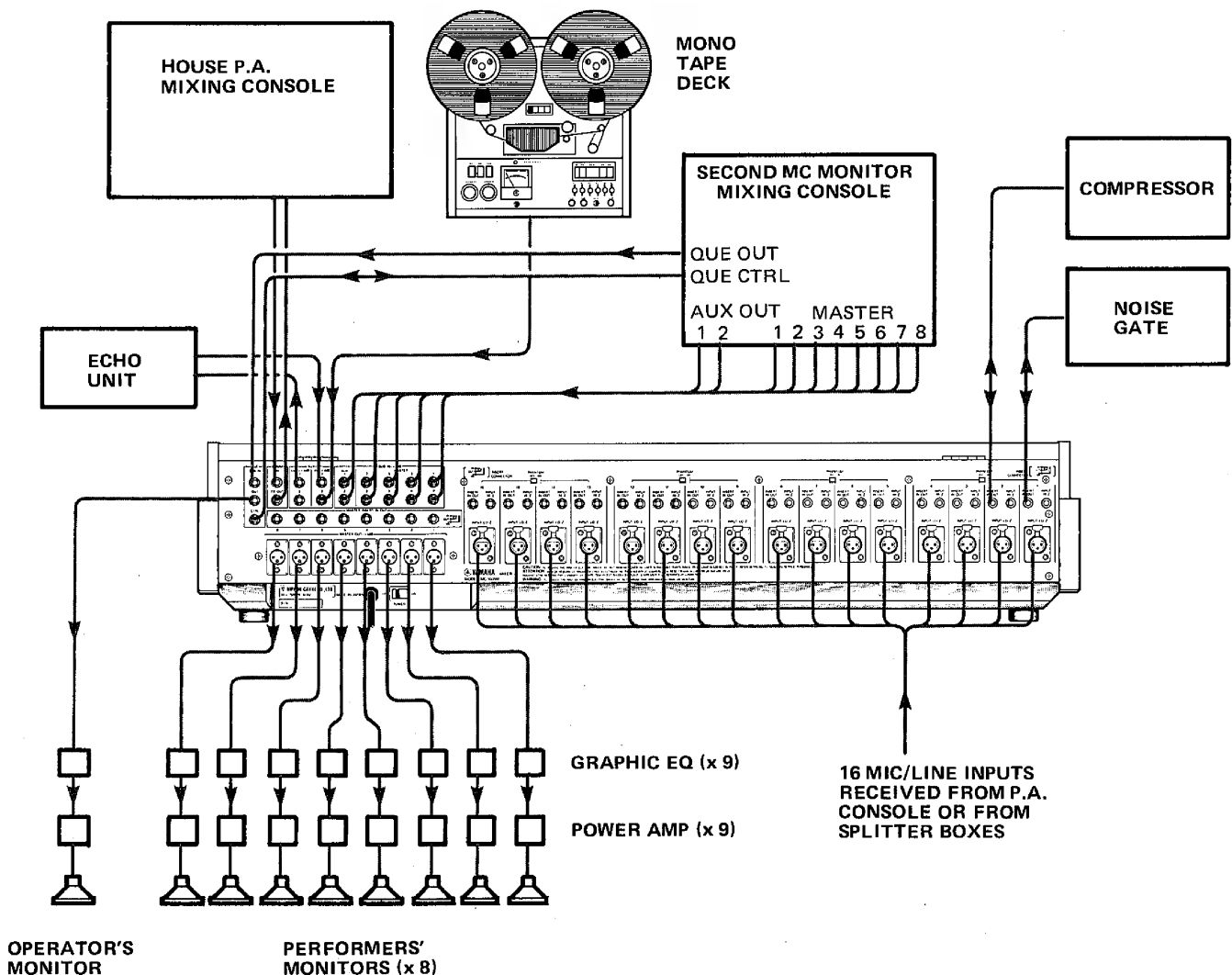
(The MC1608M mixing console is shown here. The MC2408M could equally well be used for any of these applications).

1. STAGE MONITORING SETUP

The following diagram illustrates a possible monitoring situation, using a second sub-monitor mixing console "cascaded" with the first console, in order to accommodate a large number of inputs. For example, cascading an MC2408M console with an MC1608 would provide a total of 40 inputs. The CUE CONTROL terminals of both consoles are connected, providing full-function cueing from the main unit. An echo unit is patched into the AUX 1 circuit. The AUX 1 controls on the input channels will function as individual echo sends for each instrument, and the AUX 1 OUT control is the master echo send. Echo return is adjusted using the AUX IN level control, and the echo can be assigned to any of the eight monitor mixes, according to the performers' wishes, using the AUX OUT ASSIGN switches. A mono tape deck is patched into the AUX 2 input. For setting the overall level of each monitor when the performers are not present, a tape

can be played through each monitor by pressing the AUX ASSIGN switches and adjusting the appropriate master levels. Each master output is connected to a monitor amp via a graphic equalizer, for accurate equalization of each monitor, and for "ringing out" (controlling feedback by lowering frequency response at feedback peak frequencies) the system. These equalizers could also be connected to the master INSERT terminals. Two of the input INSERTS are connected to effects units — a compressor (useful for adding punch to vocals, for example) and a noise gate (which could be used to eliminate hum from a guitar). Any effects units could be used, in the input inserts for individual instruments, or in the master inserts for individual monitor mixes.

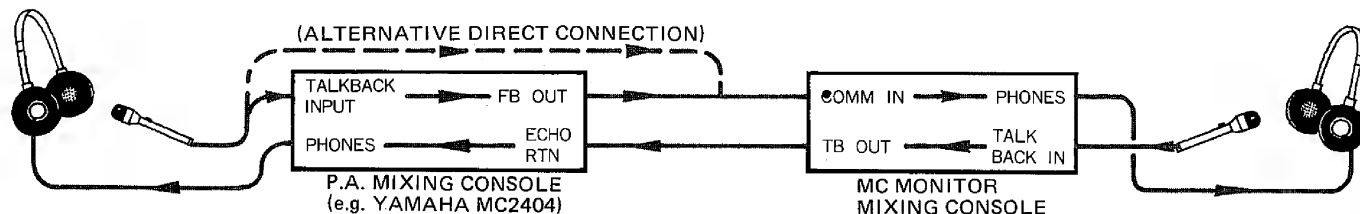
The operator can monitor on headphones or via an amplifier/speaker system connected to the CUE OUTPUT, by pressing the appropriate cue switches.



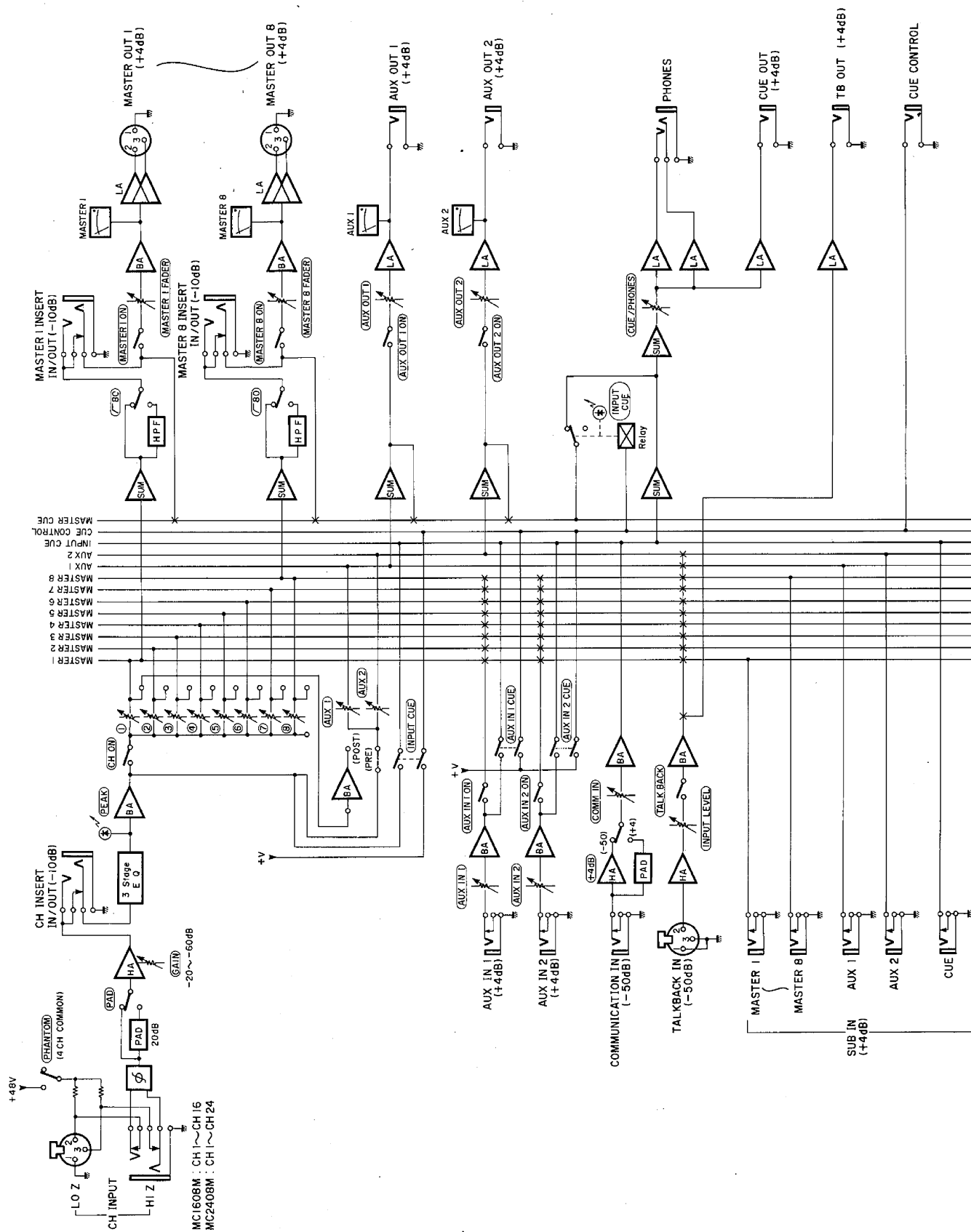
Communication between the monitor operator and the house soundman is provided in the following manner: the monitor operator plugs his TB microphone into the TB input connector on the front panel. The signal from this input is sent out via the TB OUT connector, to the ECHO RETURN input of the main house console (e.g., a Yamaha MC2404). If the echo return input is not available, an input channel could be used to receive the monitor TB. This signal would not be assigned to any output on the house console, merely

CUE'd for headphone monitoring by the engineer. The house soundman sends his TB signal via his foldback output to the COMM IN connector of the monitor console. In this case the +4 dB pad should be inserted, and the COMM IN level control adjusted to maintain a correct signal level.

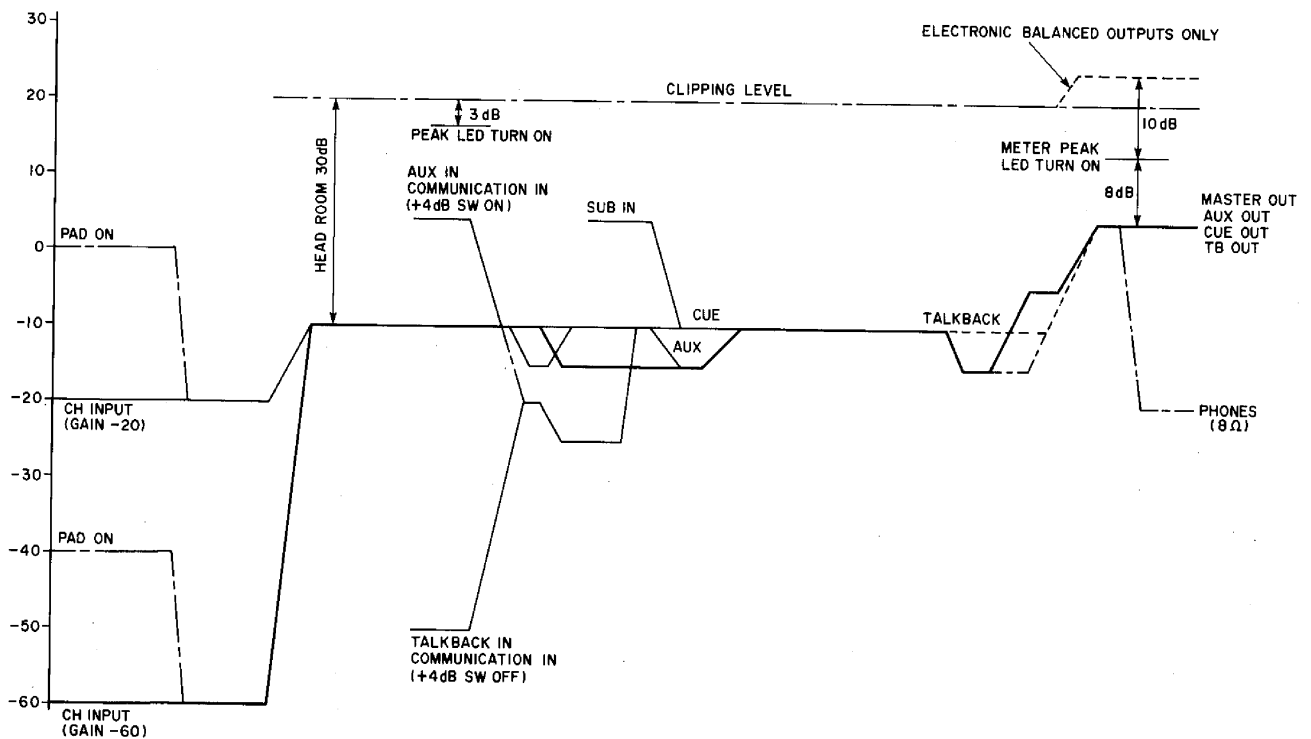
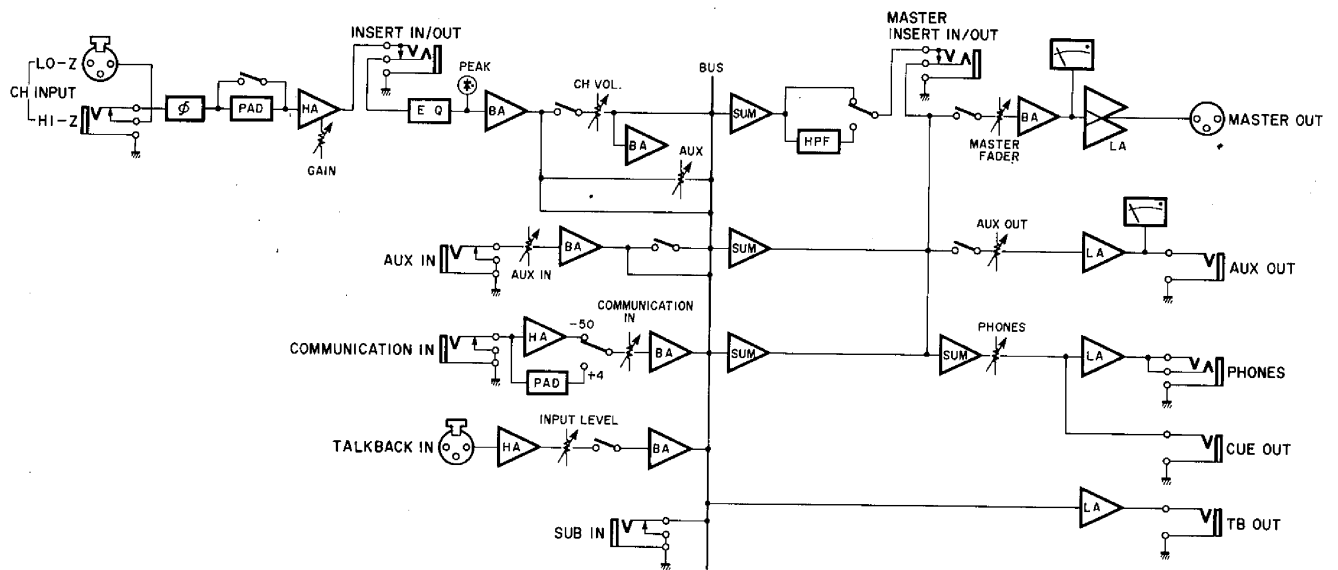
If communication were required with a stage manager, conductor, or dressing room, a microphone could be connected directly with the COMM IN jack. In this case, the +4 dB pad would not be needed.



BLOCK DIAGRAM



LEVEL DIAGRAM



INPUT/OUTPUT SPECIFICATIONS

■ INPUTS

Input	PAD	GAIN	Input impedance	Source impedance	Sensitivity*	Input levels		Connector type
						Rated level	Maximum non-clipping level	
CH INPUT (MC1608M 1 ~ 16) (MC2408M 1 ~ 24)	OFF (0dB)	-60dB	LO Z 4kΩ	50 ~ 250Ω Microphones	-72dB (0.195mV)	-60dB (0.775mV)	-30dB (24.5mV)	XLR type (Balanced) Phone Jack (TRS) (Balanced)
		-20dB	HI Z 10kΩ	or 600Ω Lines	-32dB (19.5mV)	-20dB (77.5mV)	+10dB (2.45V)	
	ON (20dB)			600Ω Lines	-12dB (195mV)	0dB (775mV)	+20dB (7.75V)	
CH INSERT IN (MC1608M 1 ~ 16) 								

■ OUTPUTS

Output	Output impedance	Load impedance	Output levels		Connector type
			Rated level	Maximum non-clipping level	
MASTER OUT (1 ~ 8)	150 Ω	600 Ω Lines	+4dB (1.23V)	+22dB (9.76V)	XLR type (Balanced)
AUX OUT (1, 2)	150 Ω	600 Ω Lines	+4dB (1.23V)	+18dB (6.16V)	Phone Jack (Unbalanced)
TB OUT	150 Ω	600 Ω Lines	+4dB (1.23V)	+18dB (6.16V)	Phone Jack (Unbalanced)
CUE OUT	150 Ω	600 Ω Lines	+4dB (1.23V)	+18dB (6.16V)	Phone Jack (Unbalanced)
CH INSERT OUT (MC1608M 1 ~ 16) (MC2408M 1 ~ 24)	100 Ω	10k Ω Lines	-10dB (245mV)	+20dB (7.75V)	Phone Jack (TRS) (Unbalanced)
MASTER INSERT OUT (1 ~ 8)	600 Ω	10k Ω Lines	-10dB (245mV)	+20dB (7.75V)	Phone Jack (TRS) (Unbalanced)
PHONES OUT	100 Ω	8 Ω Phones	1mW	20mW	Stereo Phone Jack (Unbalanced)
		40 Ω Phones	3mW	130mW	

* Input level required to produce rated +4dB output level.

● 0dB = 0.775V r.m.s.

SPECIFICATIONS

FREQUENCY RESPONSE	20Hz ~ 20kHz +1/-3dB (@600 ohms, +4dB)
TOTAL HARMONIC DISTORTION	Less than 0.05% (20Hz ~ 20kHz @600 ohms, +4dB)
NOISE LEVELS*	
Equivalent input noise	-128dB (Rs = 150 ohms)
Residual output noise	-95dB (balanced output)
Master Out	-70dB (Master fader - nominal** All input volumes - minimum)
	-64dB (Master fader - nominal** One input volumes - nominal**)
Aux Out	-67dB (Aux output volume - nominal** All AUX input volumes - minimum)
	-62dB (Aux output volume - nominal** One Aux input volume - nominal**)
MAXIMUM VOLTAGE GAIN	
CH INPUT → MASTER OUT	76dB
CH INPUT → AUX OUT	76dB
AUX IN → MASTER OUT	12dB
TALKBACK INPUT → MASTER OUT	66dB
MASTER SUB IN → MASTER OUT	6dB
AUX SUB IN → AUX OUT	6dB
CUE SUB IN → CUE OUT	6dB
EQUALIZER CHARACTERISTICS	
LOW	+/-15dB (100 Hz shelving)
MID	+/-15dB (350Hz ~ 5kHz peaking)
HIGH	+/-15dB (10kHz shelving)
CROSSTALK (measured at 1kHz)	
MIXBUSS to MIXBUSS	Less than -60dB
INPUT CH to INPUT CH	Less than -60dB

VU METERS	
MASTER 1 ~ 8, AUX 1, 2 (0 VU = 4dB)	
PEAK INDICATORS	
INPUT (red)	Lights 3dB below clipping
VU (red)	Lights 8dB above 0 VU
POWER REQUIREMENTS (Usable voltage range)	
US & Canadian models	120V (105V ~ 130V), 60Hz
General model	110V ~ 120V (115V ± 15%) 220V ~ 240V (230V ± 15%), 50/60Hz
POWER CONSUMPTION	
US & Canadian models	70W
General model	80W
DIMENSIONS (WxHxD)	
MC1608M	919 mm x 185.5 mm x 654.3 mm (36-3/16" x 7-5/16" x 25-3/4")
MC2408M	1232 mm x 185.5 mm x 654.3 mm (48-1/2" x 7-5/16" x 25-3/4")
WEIGHT	
MC1608M	26 kg (57 lbs. 3 oz.)
MC2408M	33 kg (72 lbs. 10 oz.)

* Measured with a -6dB/octave LPF @12.7kHz.
 **Nominal = 6dB below maximum.
 0dB = 0.775V r.m.s.
 Specifications subject to change without notice.

SINCE 1887



YAMAHA

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